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Fossil Mammals of the Puerco Beds. By HENRY FAIRFIELD OSBORN and CHARLES EARLE. Bull. American Museum of Natural History. Vol. viii., Art. I. Pp. 1-70.

The Puerco Eocene (or Post-Cretaceous) was discovered and named by Cope in 1880, and up to the present time our knowledge of its very remarkable and interesting fauna has been due almost entirely to his labors. It is a fauna which in many ways is very puzzling and raises many exceedingly difficult problems. To the solution of these problems the admirable work of Osborn and Earle is an important contribution. While adding but few new names to the long list of genera and species already established by Cope, the authors have accomplished what is of far greater value, namely, materially increased our knowledge concerning the structure and systematic relationships of many mammals which had previously been known only from fragmentary remains. In this way the character of the fauna as a whole is set in much clearer light than ever before.

Of the more significant results of this investigation, the following deserve particular mention: (1) The determination of the complete dentition of *Polymastodon*, a representative of the Multituberculata, which was one of the dominant types of Mesozoic mammals. (2) The description of parts of the skeleton of *Indrodon*, showing that it was a true lemuroid, as had been doubtfully surmised before, and the reference of the *Chriacide* to the same group. Cope had referred the genera of this family to the creodonts, an example which I had followed, though expressing the opinion that Chriacus and its allies might eventually prove to be lemuroids. (3) A very welcome contribution to our knowledge of the Puerco creodonts is the description of an excellent skeleton of *Dissacus*, the ancestral form of the *Mesonychidae*. What renders this particularly valuable is the fact that the Bridger genus

Mesonyx is already very completely known, and the comparison of the two forms is very instructive for discerning some of the modes of mammalian development. (4) A nearly complete skull of the primitive tillodont *Onychodectes* is described and has an important bearing upon the early morphology of the mammalian skull. (5) The skull of *Pantolambda*, the forerunner of the coryphodonts, which became so abundant and varied in the succeeding Wasatch time, is for the first time made known. This is one of the most valuable results of the whole investigation. (6) The suggestion originally made by Schlosser, that *Mioclenus* and its allies are ungulates rather than creodonts, is confirmed, and a new family of Condylarthra is established for their reception. (7) The upper teeth of *Protogonodon* are determined and the likeness of its dentition to that of the primitive artiodactyls pointed out.

Of the greatest general interest to both geologists and biologists are the conclusions reached regarding the character of the Puerco fauna as a whole, which is shown to be of a prevailingly Mesozoic type. Only a small fraction of this fauna is ancestral to Wasatch and Bridger types, and of these most do not persist beyond the Eocene, while by far the greater number of Puerco genera die out without leaving any successors behind them. This generalization is of much importance in clearing away certain stratigraphical difficulties. It is hardly an exaggeration to say that the Puerco mammalian fauna differs more from that of the Wasatch than does the latter from the recent fauna. If the Wasatch mammals, as a whole, were derived from those of the Puerco, then we must assume the existence of a long, unrecorded gap between the two formations, an assumption which geological data do not support. When, however, we examine the Wasatch genera which clearly were derived from Puerco ancestors, such as *Coryphodon*, *Pachyana*, *Didymictis*, *Ana-*

codon, etc., we find that the degree of advance displayed by these forms is not so very great and that it does not involve any very long lapse of time. The radical difference between the two faunas consists in the ordinal groups which are present in one and not in the other. Thus the Puerco has neither artiodactyls, perissodactyls nor rodents, while the Wasatch has no Multituberculata and relatively few Condylarthra, and the creodonts of the two formations belong, for the most part, to quite different types. The obvious significance of these facts is that at some time between the Puerco and the Wasatch a great migration of mammals from some other region took place and revolutionized the character of the North American fauna.

A distinction that is likely to be fruitful of important results is Osborn's division of the placental mammals into the Mesoplacentalia, of early and more or less Mesozoic type, and the Cenoplacentalia, characteristic of later Tertiary and recent time. "The difference between these two groups consists mainly in the lower state of evolution and apparent incapacity for higher development exhibited by the Mesoplacentals, in contrast with the capacity for rapid development shown by the Cenoplacentals." It can hardly be right, however, to include the creodonts in the lower group, since they not only underwent a great expansion in the Puerco, but in later times they also gave rise, by independent development along at least three lines, to the true Carnivora. Such a group cannot be fairly charged with 'incapacity for higher development.'

This necessarily brief review cannot do more than indicate the many points of unusual interest in this paper, and must refer to the original those who would learn more of it.

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The Ornithology of Illinois; Descriptive Catalogue. By ROBERT RIDGWAY. Published by authority of the State Legislature. Vol. II. May, 1895. Large 8°, pp. 282, pls. 33.

Ridgway's Ornithology of Illinois has a curious history. It was conceived by the able Director of the Illinois State Laboratory of Natural History, Prof. S. A. Forbes, who twelve years ago asked the leading American ornithologist to undertake its preparation. Mr. Ridgway finished the manuscript early in July, 1885. The first volume was finally printed, but the entire edition, together with the plates and cuts, was destroyed by fire. This was in February, 1887. It was reprinted from proof sheets, and proof of the reprint was not submitted to the author. It was issued in November, 1889.

By a singular fatality, the manuscript of the second volume was consumed in the same fire; and, excepting proof of the first 90 pages, which was preserved, the entire book had to be rewritten. This formidable and disheartening task was accomplished in 1891, and the printed book has just been received (May 7, 1895).

The original plan contemplated two distinct parts: Part I., Descriptive Catalogue, by Robert Ridgway; Part II., Economic Ornithology, by S. A. Forbes. The present volume completes the Descriptive Catalogue, and it is earnestly hoped that the volume on Economic Ornithology will follow; though the labor of preparing such a work is too great to be accomplished in a single lifetime or by a single man.

The first volume is prefaced by an introduction of 35 pages, treating of the physical features of the State, the climate, and characteristic features of the avifauna, and ending with a bibliography. The systematic part begins with a key to the higher groups, which are arranged in the old style, the Thrushes coming first. The orders, fami-